

# iPIX

## IMAGING VIGNETTE

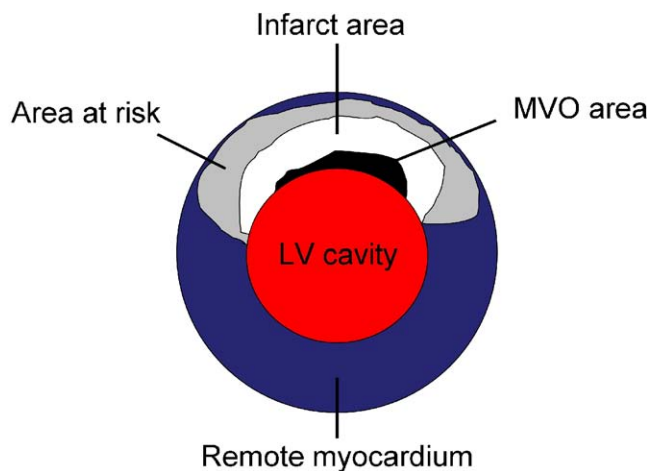
### Characterization of Acute Myocardial Infarction by Magnetic Resonance Imaging

Adam N. Mather, MBBS,\* John P. Greenwood, PhD,\* Sven Plein, MD, PhD\*†

**CARDIAC MAGNETIC RESONANCE (CMR) IMAGING** has the unique ability to characterize a range of pathophysiologic effects of acute myocardial infarction (AMI). Multiparametric CMR assessment with cine imaging, T2-weighted imaging, and early or late gadolinium-enhanced acquisition delineates contractile function, myocardial edema, microvascular obstruction (MVO), intracardiac thrombus, and myocardial scar. Many of these parameters have prognostic significance (e.g., left ventricular ejection fraction, extent of scar, and presence of MVO). Therefore, CMR can contribute to the risk stratification of patients with AMI and may play an important future role in assessing the efficacy of treatment strategies. In this article, we present 5 clinical cases that demonstrate the spectrum of pathophysiology associated with AMI that can be identified by CMR (Figs. 1 to 6).

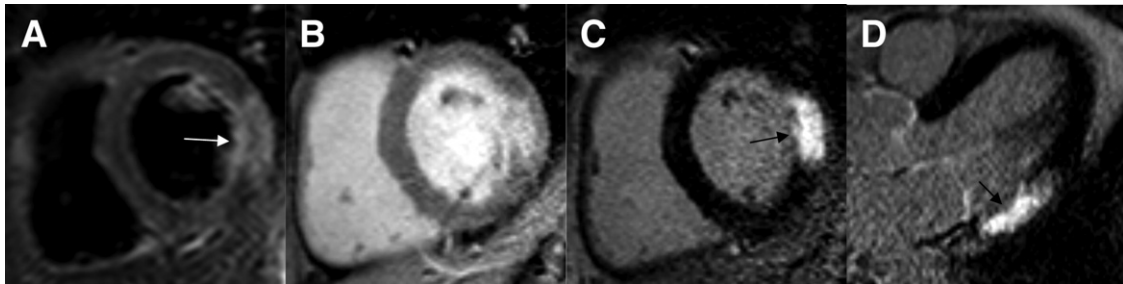
**Figure 1. Schematic Diagram of Infarct Characteristics That Can Be Assessed by CMR**

Edema in the area at risk from the culprit lesion can be visualized using T2-weighted imaging. The infarct area is delineated by late gadolinium enhancement and microvascular obstruction (MVO) by early (or late) gadolinium enhancement. The difference between infarction and area at risk represents the potential area of myocardial salvage. LV = left ventricle.

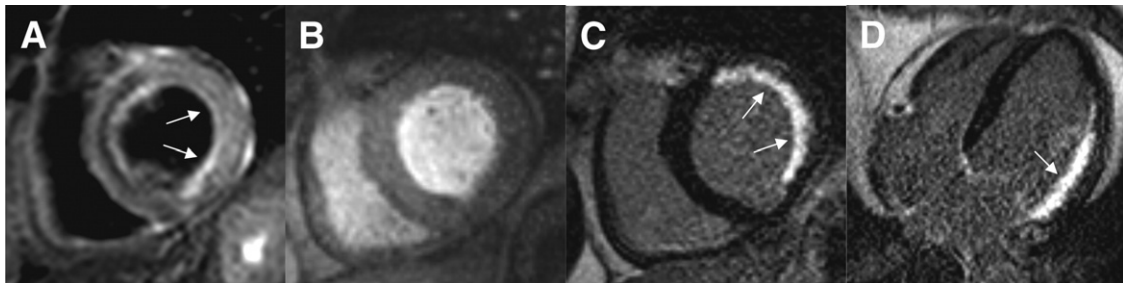


**Figure 2. Transmural Infarction With No Myocardial Salvage**

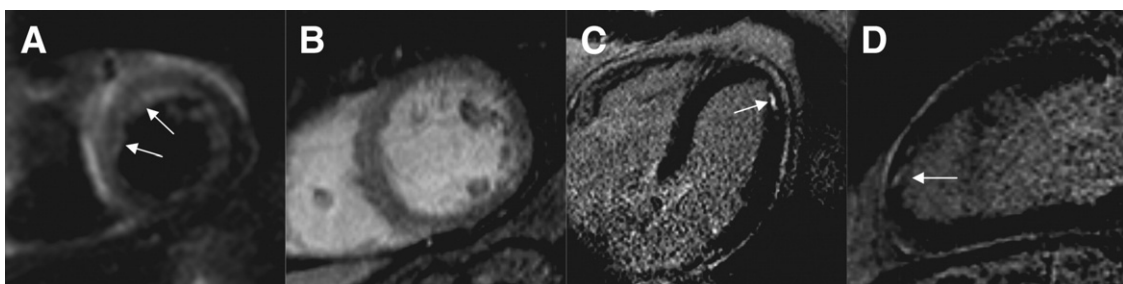
A 40-year-old man presented with an acute lateral ST-segment elevation myocardial infarction. He was successfully resuscitated from ventricular fibrillation and then underwent primary percutaneous coronary intervention (PCI) to an occluded obtuse marginal branch approximately 6 h after the onset of chest pain. CMR imaging was performed 2 days after the index event. (A) T2-weighted image demonstrates a localized area of myocardial edema in the lateral wall (arrow). (B) Early gadolinium enhancement did not demonstrate any microvascular obstruction. (C and D) Late gadolinium enhancement demonstrated a region of transmural infarction (arrows) that exactly matched the area at risk as identified by T2-weighted imaging. Hence, PCI in this case did not salvage any viable myocardium.

**Figure 3. Subendocardial Infarction With Myocardial Salvage**

A 48-year-old man presented with a posterolateral acute myocardial infarction and was treated with primary percutaneous coronary intervention within 4 h after the onset of chest pain. CMR imaging was performed 2 days after the index event. (A) T2-weighted image demonstrates a large transmural region of myocardial edema in the anterolateral and posterolateral walls (arrows). (B) Early gadolinium enhancement image shows no evidence of microvascular obstruction. (C and D) Late gadolinium enhancement images show 50% transmural infarction (arrows), thus suggesting substantial myocardial salvage.

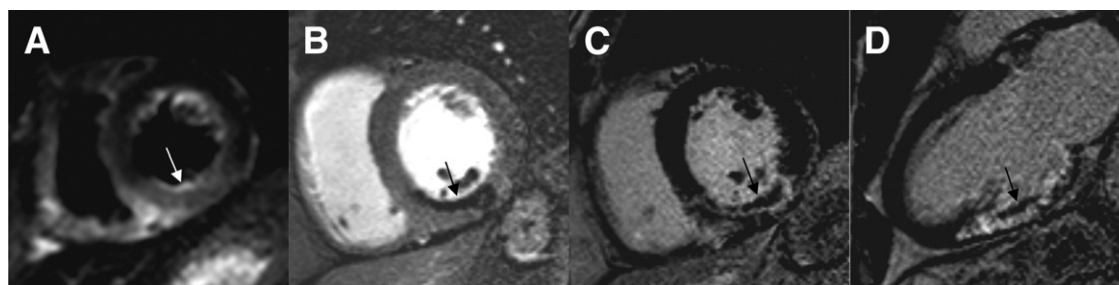
**Figure 4. Small Infarction With Substantial Myocardial Salvage**

A 63-year-old man presented with an anterior ST-segment elevation myocardial infarction and was treated successfully with primary percutaneous coronary intervention within 2 h of symptom onset. CMR imaging was performed 2 days after the index event. (A) T2-weighted image shows a large area at risk with transmural myocardial edema in the anterior and anteroseptal walls (arrows). (B) Early gadolinium enhancement did not demonstrate any microvascular obstruction. (C and D) Late gadolinium enhancement images show a tiny area of subendocardial infarction in the apical anterior wall (arrows). This case highlights the importance of early reperfusion therapy to maximize salvage of viable myocardium at risk.



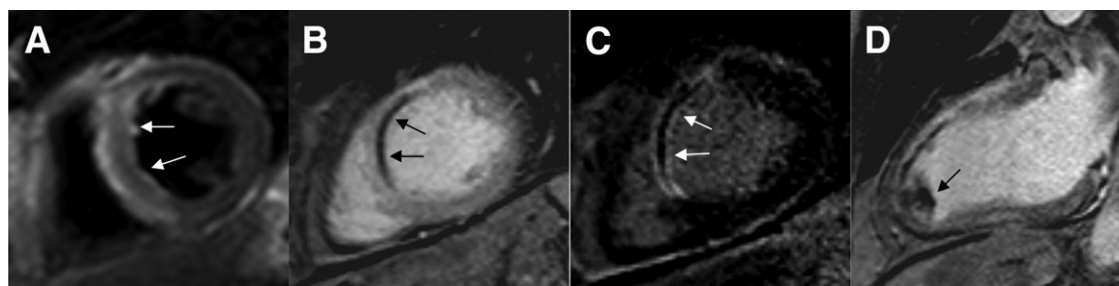
### Figure 5. Transmural Infarction With Myocardial Salvage and MVO

A 62-year-old man presented with chest pain, and electrocardiography confirmed an inferolateral ST-segment elevation myocardial infarction. He was resuscitated from ventricular fibrillation and then underwent successful primary percutaneous coronary intervention to an occluded right coronary artery. Intracoronary thrombus was aspirated using a thrombectomy device prior to stenting. CMR imaging was performed 2 days after the index event. (A) T2-weighted image demonstrates myocardial edema in the left ventricular (LV) inferior wall (arrow). (B) Early gadolinium enhancement (EGE) image shows a substantial area of low signal intensity consistent with microvascular obstruction (MVO) (arrow). (C and D) Late gadolinium enhancement (LGE) images confirm MVO within an area of transmural infarction in the LV inferior wall (arrows). Note the smaller MVO extent on LGE compared with EGE, representing contrast agent diffusion into the MVO area over time.



### Figure 6. Transmural Infarction With MVO and Apical Thrombus

A 62-year-old man presented with an anterior ST elevation myocardial infarction. Primary percutaneous coronary intervention to an occluded left anterior descending artery was performed successfully within 3 h of symptom onset. Intracoronary thrombus was aspirated using a thrombectomy device before stent implantation. CMR imaging was performed 2 days after the index event. (A) T2-weighted image shows increased signal intensity in the anteroapical region, suggesting myocardial edema (arrows). (B) Early gadolinium enhancement (EGE) demonstrates microvascular obstruction (MVO) in the interventricular septum (arrows). (C) Late gadolinium enhancement image confirms MVO within an area of transmural infarction in the anteroapical region (arrows). (D) EGE image in the long-axis view not only confirms the presence of extensive MVO in the anterior wall and apex but also highlights an intracardiac thrombus at the left ventricular apex (arrow), which was not visualized on transthoracic echocardiography performed at the bedside.



**Address for correspondence:** Dr. Adam N. Mather, Leeds General Infirmary, Academic Division of Cardiovascular Medicine, Great George Street, Leeds, UK LS1 3EX, United Kingdom. *E-mail:* [a.n.mather@doctors.org.uk](mailto:a.n.mather@doctors.org.uk).